In the Claims

Claims 1-81 (canceled)

82. (currently amended) A recombinant host cell comprising nucleic acid segments encoding non-naturally occurring fusion proteins, wherein a first nucleic acid segment comprises:

a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

a nucleic acid sequence encoding a polyhydroxyalkanote synthase protein subunit; and a second segment comprising:

a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

a nucleic acid ~~segment~~ sequence encoding an enzyme selected from the group consisting of acyl-ACP thioesterase, fatty acyl hydroxylase, yeast multifunctional protein (MFP), and hydroxyacyl-CoA epimerase.

83. (original) The recombinant host cell of claim 82, wherein the recombinant host cell is a fungal cell.

84. (currently amended) The recombinant host cell of claim 83, wherein the fungal cell is selected from the group consisting of a *Schizosaccharomyces pombe, Streptomyces rimofaciens, Fusarium, Aspergillus niger,* ~~*or*~~ and *Saccharomyces cerevisiae* cell.

85. (original) The recombinant host cell of claim 82, wherein the recombinant host cell is a plant cell.

86. (currently amended) The recombinant host cell of claim 85, wherein the plant cell is ~~selected from the group of cells~~ obtained from a plant selected from the group consisting of alfalfa, banana, barley, bean, cabbage, canola/oilseed rape, carrot, castorbean, celery, clover,

coconut, corn, cotton, cucumber, linseed, melon, olive, palm, parsnip, pea, peanut, pepper, potato, radish, rapeseed, rice, soybean, spinach, sunflower, tobacco, tomato, and wheat.

87. (currently amended) The recombinant host cell of claim 82, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second segment is an acyl-ACP thioesterase.

88. (currently amended) The recombinant host cell of claim 82, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second segment is a fatty acyl hydroxylase.

89. (currently amended) The recombinant host cell of claim 82, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second segment is a yeast multifunctional protein (MFP).

90. (currently amended) The recombinant host cell of claim 82, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second segment is a hydroxyacyl-CoA epimerase.

91. (currently amended) A genetically transformed plant cell comprising in the 5' to 3' direction:

a) a promoter to direct transcription of a structural nucleic acid ~~sequence~~ segment encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid ~~sequence~~ segment comprises:

i) a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

ii) a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein subunit;

b) a structural nucleic acid ~~sequence~~ segment encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid ~~sequence~~ segment comprises:

i) a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

ii) a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein subunit;

c) a 3' transcription terminator sequence;

d) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid coding sequence; and

e) a promoter to direct transcription of a second structural nucleic acid ~~sequence~~ segment encoding a non-naturally occurring fusion protein, wherein the second structural nucleic acid ~~sequence~~ segment comprises:

a nucleic acid sequence encoding a peroxisome targeting protein subunit; and a nucleic acid segment encoding an enzyme selected from the group consisting of acyl-ACP thioesterase, fatty acyl hydroxylase, yeast multifunctional protein (MFP), and hydroxyacyl-CoA epimerase;

f) a 3' transcription terminator sequence; and

g) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid coding sequence.

92. (previously presented) The genetically transformed plant cell of claim 91, wherein the plant cell is obtained from a plant selected from the group consisting of alfalfa, banana, barley, bean, cabbage, canola/oilseed rape, carrot, castorbean, celery, clover, coconut, corn, cotton, cucumber, linseed, melon, olive, palm, parsnip, pea, peanut, pepper, potato, radish, rapeseed, rice, soybean, spinach, sunflower, tobacco, tomato, and wheat.

93. (currently amended) The genetically transformed plant cell of claim 91, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second structural nucleic acid segment is an acyl-ACP thioesterase.

94. (currently amended) The genetically transformed plant cell of claim 91, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second structural nucleic acid segment is a fatty acyl hydroxylase.

95. (currently amended) The genetically transformed plant cell of claim 91, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second structural nucleic acid segment is a yeast multifunctional protein (MFP).

96. (currently amended) The genetically transformed plant cell of claim 91, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by the nucleic acid sequence in the second structural nucleic acid segment is a hydroxyacyl-CoA epimerase.

97. (currently amended) A genetically transformed plant comprising in the 5' to 3' direction:

a) a promoter to direct transcription of a structural nucleic acid ~~sequence~~ segment encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid ~~sequence~~ segment comprises:

i) a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

ii) a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein subunit;

b) a structural nucleic acid ~~sequence~~ segment encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid ~~sequence~~ segment comprises:

i) a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

ii) a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein subunit;

c) a 3' transcription terminator sequence;

d) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid coding sequence; and

e) a promoter to direct transcription of a second structural nucleic acid ~~sequence~~ segment encoding a non-naturally occurring fusion protein, wherein the second structural nucleic acid ~~sequence~~ segment comprises:

a nucleic acid sequence encoding a peroxisome targeting protein subunit; and a nucleic acid segment encoding an enzyme selected from the group consisting of acyl-ACP thioesterase, fatty acyl hydroxylase, yeast multifunctional protein (MFP), and hydroxyacyl-CoA epimerase;

f) a 3' transcription terminator sequence; and

g) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid coding sequence.

98. (currently amended) The genetically transformed plant of claim ~~91~~ 97, wherein the plant is selected from the group consisting of ~~an~~ alfalfa, banana, barley, bean, cabbage, canola/oilseed rape, carrot, castorbean, celery, clover, coconut, corn, cotton, cucumber, linseed, melon, olive, palm, parsnip, pea, peanut, pepper, potato, radish, rapeseed, rice, soybean, spinach, sunflower, tobacco, tomato, ~~or~~ and wheat ~~cell~~.

99. (original) The genetically transformed plant of claim 97, wherein the promoter is constitutive.

100. (currently amended) The genetically transformed plant of claim 99, wherein the promoter is selected from the group consisting of CaMV35S, enhanced CaMV35S, FMV, mas, nos, ~~or~~ and ocs.

101. (original) The genetically transformed plant of claim 97, wherein the promoter is inducible.

102. (currently amended) The genetically transformed plant of claim 101, wherein the promoter is selected from the group consisting of tac, salicyclic acid induced, polyacrylic acid induced, safener induced, heat shock promoter, nitrate induced, hormone induced, ~~or~~ and light induced.

103. (original) The genetically transformed plant of claim 97, wherein the promoter is tissue specific.

104. (currently amended) The genetically transformed plant of claim 103, wherein the promoter is selected from the group consisting of the β-conglycinin 7S promoter, napin promoter, phaseolin promoter, zein promoter, soybean trypsin inhibitor promoter, ACP promoter, stearoyl-ACP desaturase promoter, ~~or~~ and olcosin promoter.

105. (currently amended) The genetically transformed plant of claim 97, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by a nucleic acid sequence in the second structural nucleic acid segment is an acyl-ACP thioesterase.

106. (currently amended) The genetically transformed plant of claim 97, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by a nucleic acid sequence in the second structural nucleic acid segment is a fatty acyl hydroxylase.

107. (currently amended) The genetically transformed plant of claim 97, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by a nucleic acid sequence in the second structural nucleic acid segment is a yeast multifunctional protein (MFP).

108. (currently amended) The genetically transformed plant of claim 97, ~~further comprising a nucleic acid segment encoding~~ wherein the enzyme encoded by a nucleic acid sequence in the second structural nucleic acid segment is a hydroxyacyl-CoA epimerase.

109. (previously presented) A method of preparing host cells useful to produce a non-naturally occurring fusion protein comprising the steps of:

a) selecting a host cell;

b) transforming the selected host cell with a first recombinant vector having a structural nucleic acid sequence encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid comprises:

i) a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

ii) a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein subunit; and

c) transforming the selected host cell with a second recombinant vector having a structural nucleic acid sequence encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid comprises:

a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

a nucleic acid segment encoding an enzyme selected from the group consisting of acyl-ACP thioesterase, fatty acyl hydroxylase, yeast multifunctional protein (MFP), and hydroxyacyl-CoA epimerase; and

d) obtaining transformed cells.

110. (original) The method of claim 109, wherein the vector further comprises a selectable marker.

111. (previously presented) The method of claim 110, wherein the selectable marker is selected from the group consisting of a kanamycin resistance marker, a hygromycin resistance marker, and herbicide resistance marker.

112. (original) The method of claim 109, wherein the host cell is a fungal cell.

113. (currently amended) The method of claim 112, wherein the fungal cell is selected from the group consisting of a *Schizosaccharomyces pombe, Streptomyces rimofaciens, Fusarium, Aspergillus niger,* ~~or~~ and *Saccharomyces cerevisiae* cell.

114. (original) The method of claim 109, wherein the host cell is a plant cell.

115. (currently amended) The method of claim 114, wherein the plant cell is obtained from a plant selected from the group consisting of alfalfa, banana, barley, bean, cabbage, canola/oilseed rape, carrot, castorbean, celery, clover, coconut, corn, cotton, cucumber, linseed,

melon, olive, palm, parsnip, pea, peanut, pepper, potato, radish, rapeseed, rice, soybean, spinach, sunflower, tobacco, tomato, and wheat.

116. (previously presented) A method of preparing a transformed plant useful to produce a non-naturally occurring fusion protein comprising the steps of:

a) selecting a host cell;

b) transforming the selected host cell with a first recombinant vector having a structural nucleic acid sequence encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid sequence comprises:

i) a nucleic acid sequence encoding a peroxisome targeting protein subunit; and

ii) a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein subunit;

c) transforming the selected host cell with a second recombinant vector having a structural nucleic acid sequence encoding a non-naturally occurring fusion protein, wherein the structural nucleic acid sequence comprises:

i) a nucleic acid sequence encoding a peroxisome targeting protein subunit and

ii) a nucleic acid segment encoding an enzyme selected from the group consisting of acyl-ACP thioesterase, fatty acyl hydroxylase, yeast multifunctional protein (MFP), and hydroxyacyl-CoA epimerase; and

d) obtaining transformed host plant cells; and

e) regenerating the transformed host plant cells.

117. (original) The method of claim 116, wherein the vector further comprises a selectable marker.

118. (currently amended) The method of claim 117, wherein the selectable marker is selected from the group consisting of a kanamycin resistance marker, a hygromycin resistance marker, ~~or~~ and a herbicide resistance marker.

119. (currently amended) The method of claim 116, wherein the host plant cell is obtained from a plant selected from the group consisting of ~~an~~ alfalfa, banana, barley, bean, cabbage, canola/oilseed rape, carrot, castorbean, celery, clover, coconut, corn, cotton, cucumber, linseed, melon, olive, palm, parsnip, pea, peanut, pepper, potato, radish, rapeseed, rice, soybean, spinach, sunflower, tobacco, tomato, ~~or~~ and wheat ~~cell~~.

120. (original) The plant produced by the method of claim 116.

121. (previously presented) A method for the preparation of a polyhydroxyalkanoate, comprising the steps of:

a) obtaining a cell capable of producing a non-naturally occurring first fusion protein, wherein the fusion protein comprises:

i) a peroxisome targeting protein subunit; and

ii) a polyhydroxyalkanoate synthase protein subunit; and

wherein the cell is capable of producing a second non-naturally occurring fusion protein, wherein the fusion protein comprises:

i) a peroxisome targeting protein subunit; and

ii) an enzyme selected from the group consisting of acyl-ACP thioesterase, fatty acyl hydroxylase, yeast multifunctional protein (MFP), and hydroxyacyl-CoA epimerase; and

b) establishing a culture of the cell; and

c) culturing the cell under conditions suitable for the production of the polyhydroxyalkanotate.

122. (original) The method of claim 121, wherein the culture contains natural fatty acids, non-natural fatty acids, or mixtures thereof.

123. (original) The method of claim 121, wherein the cell is a fungal cell.

124. (currently amended) The method of claim 123, wherein the fungal cell is selected from the group consisting of a *Schizosaccharomyces pombe, Streptomyces rimofaciens, Fusarium, Aspergillus niger,* ~~or~~ and *Saccharomyces cerevisiae* cell.

125. (original) The method of claim 121, wherein the cell is a plant cell.

126. (currently amended) The method of claim 125, wherein the cell is obtained from a plant selected from the group consisting of alfalfa, banana, barley, bean, cabbage, canola/oilseed rape, carrot, castorbean, celery, clover, coconut, corn, cotton, cucumber, linseed, melon, olive, palm, parsnip, pea, peanut, pepper, potato, radish, rapeseed, rice, soybean, spinach, sunflower, tobacco, tomato, and wheat ~~cell~~.

127. (currently amended) The method of claim 121, wherein the polyhydroxyalkanoate comprises a monomer selected from the group consisting of 3-hydroxyhexanoic acid (H:6), 3-hydroxyoctanoic acid (H:8), 3-hydroxydecanoic acid (H:10), 3-hydroxydodecanoic acid (H:12), 3-hydroxytetradecanoic acid (H:14), 3-hydroxyhexadecanoic acid (H:16), 3-hydroxyheptanoic acid (H:7), 3-hydroxynonanoic acid (H:9), 3-hydroxyundecanoic acid (H:11); 3-hydroxytridecanoic acid (H:13), 3-hydroxyhexadecatrienoic acid (H16:3), 3-hydroxyhexadecadienoic acid (H16:2), 3-hydroxyhexadecenoic acid (H16:1), 3-hydroxytetradecatrienoic acid (H14:3), 3-hydroxytetradecadienoic acid (H14:2), 3-

hydroxytetradecenoic acid (H14:1), 3-hydroxydodecadienoic acid (H12:2), 3-hydroxydodecenoic acid (H12:1), 3-hydroxyoctenoic acid (H8:1), 4-hydroxydecanoic acid, 8-methyl-3-hydroxynonanoic acid, ~~or~~ and 6-methyl-3-hydroxyheptanoic acid monomers.

128. (previously presented) A method for the preparation of a polyhydroxyalkanoate, comprising the steps of:

a) obtaining a plant capable of producing a non-naturally occurring first fusion protein, wherein the fusion protein comprises:

i) a peroxisome targeting protein subunit; and

ii) a polyhydroxyalkanoate synthase protein subunit; and wherein the plant is capable of producing a second non-naturally occurring fusion protein, wherein the fusion protein comprises:

i) a peroxisome targeting protein subunit; and

ii) an enzyme selected from the group consisting of acyl-ACP thioesterase, fatty acyl hydroxylase, yeast multifunctional protein (MFP), and hydroxyacyl-CoA epimerase; and

b) growing the plant under conditions suitable for the production of the polyhydroxyalkanoate.

129. (original) The method of claim 128, further comprising supplementing the plant with natural fatty acids, non-natural fatty acids, or mixtures thereof.

130. (currently amended) The method of claim 128, wherein the plant is selected from the group consisting of ~~an~~ alfalfa, banana, barley, bean, cabbage, canola/oilseed rape, carrot, castorbean, celery, clover, coconut, corn, cotton, cucumber, linseed, melon, olive, palm, parsnip,

pea, peanut, pepper, potato, radish, rapeseed, rice, soybean, spinach, sunflower, tobacco, tomato, ~~or~~ and wheat ~~plant~~.

131. (currently amended) The method of claim 128, wherein the polyhydroxyalkanoate comprises a monomer selected from the group consisting of 3-hydroxyhexanoic acid (H:6), 3-hydroxyoctanoic acid (H:8), 3-hydroxydecanoic acid (H:10), 3-hydroxydodecanoic acid (H:12), 3-hydroxytetradecanoic acid (H:14), 3-hydroxyhexadecanoic acid (H:16), 3-hydroxyheptanoic acid (H:7), 3-hydroxynonanoic acid (H:9), 3-hydroxyundecanoic acid (H:11); 3-hydroxytridecanoic acid (H:13), 3-hydroxyhexadecatrienoic acid (H16:3), 3-hydroxyhexadecadienoic acid (H16:2), 3-hydroxyhexadecenoic acid (H16:1), 3-hydroxytetradecatrienoic acid (H14:3), 3-hydroxytetradecadienoic acid (H14:2), 3-hydroxytetradecenoic acid (H14:1), 3-hydroxydodecadienoic acid (H12:2), 3-hydroxydodecenoic acid (H12:1), 3-hydroxyoctenoic acid (H8:1), 4-hydroxydecanoic acid, 8-methyl-3-hydroxynonanoic acid, ~~or~~ and 6-methyl-3-hydroxyheptanoic acid monomers.

132. (currently amended) A plant containing a polyhydroxyalkanoate, wherein the polyhydroxyalkanoate comprises a monomer selected from the group consisting of 3-hydroxydodecanoic acid (H:12), 3-hydroxytetradecanoic acid (H:14), 3-hydroxyhexadecanoic acid (H:16), 3-hydroxynonanoic acid (H:9), 3-hydroxyundecanoic acid (H:11); 3-hydroxytridecanoic acid (H:13), 3-hydroxyhexadecatrienoic acid (H16:3), 3-hydroxyhexadecadienoic acid (H16:2), 3-hydroxyhexadecenoic acid (H16:1), 3-hydroxytetradecatrienoic acid (H14:3), 3-hydroxytetradecadienoic acid (H14:2), 3-hydroxytetradecenoic acid (H14:1), 3-hydroxydodecadienoic acid (H12:2), 3-hydroxydodecenoic acid (H12:1), 3-hydroxyoctenoic acid (H8:1), 4-hydroxydecanoic acid, 8-methyl-3-hydroxynonanoic acid, ~~or~~ and 6-methyl-3-hydroxyheptanoic acid monomers.

Claim 133 (canceled)